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Application of Dempster-Shafer Theory Method in Expert System for Diagnosis of Psychological Disorders in Children

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ABSTRACT

The development of technology at this time has changed very rapidly in recent decades. *Expert* system is one of the sub-sections of artificial intelligence that aims to process and display the results of the conclusion of the previous process based on the knowledge that has been obtained. The purpose of this research is to apply the *Dempster-Shafer* method to the expert system for diagnosing psychological disorders in children and to design and build an expert system using the *Dempster-Shafer* method on a *website-based* expert system for diagnosing psychological disorders in children. Based on the results and discussion in this study, it can be concluded that the Dempster *Shafer* Method can be applied properly in an expert system for diagnosing psychological disorders in children. The *Dempster Shafer* method in this system gets results that are accurate enough so that it can generate a diagnosis based on symptoms accompanied by a handling solution. This expert system application for diagnosing psychological disorders in children can diagnose and determine the diagnosis results from consultations conducted by users using the *Dempster Shafer* method. Where in the example case, the percentage result is around 87.15%. This system can also help parents to get information about children's psychological disorders, symptoms, and solutions that can be applied.

INTRODUCTION

The development of technology at this time has changed very rapidly in recent decades. The development of technology that began with the invention of computers to develop until now with the internet revolution which further encourages the development of technological innovation itself. Current technological developments can also help and facilitate the work of humans, both in everyday life and in various other fields such as, in the health sector, education and others. One example of current technological developments that can help and facilitate human work is *expert* system technology.

Expert System is one of the sub-sections of artificial intelligence that aims to process and display the results of the conclusion of the previous process based on the knowledge that has been obtained. (Fernando et al., 2022). In an expert system, the knowledge possessed by an expert will be adopted into a system, so that the system will have a knowledge base like that of an expert, so that it can help solve the problem at hand.

In recent years, mental disorders have become an important aspect of human development and especially in the field of health. Awareness of mental health is very important, this is because mental disorders can affect daily life and also a person's quality of life, be it in the work environment, family or other things. *Mental illness,* also known as psychological disorders, is a health condition that will affect several things from a person, such as feelings, behavior, and mood. Psychological disorders can not only occur in adults, but can also occur in children. Mental disorders in children are influenced by a number of interrelated factors, which include genetic factors, family environment, social interaction, and the influence of the school environment.

In surveys conducted in developed countries such as the United States, mental disorders in the family and school environment are estimated to be around 20-25% of children and adolescents who experience mental health problems, and 40% of them meet the diagnostic criteria for various types of mental disorders. In an epidemiological study conducted in the United States showed the results that 1 in 10 children showed depressive symptoms before the age of 14, and 20% of children aged 16-17 years experienced anxiety, *mood* and substance use disorders. (Klaten, 2022).

Meanwhile, a survey conducted by the *Indonesia National Adolescent Mental Health Survey* (I-NAMHS) in 2022 showed that 1 in 3 children and adolescents in Indonesia had mental health problems and 1 in 20 adolescents in Indonesia had psychological disorders in the past 12 months. This equates to 15.5 million and 2.45 million children and adolescents respectively. In this survey, it was also found that the most common psychological disorder suffered by Indonesian adolescents is anxiety disorder (a combination of social phobia and generalized anxiety disorder) with a percentage of 3.7%, followed by major depressive disorder of around 1.0% and behavioral disorders of 0.9% and post-traumatic stress disorder of around 0.5%. (Barus, 2022).

A survey conducted in Indonesia showed a high percentage of diagnoses of psychological disorders in children.

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However, there are still many adolescents and children in Indonesia who do not receive professional treatment to overcome the problems they suffer. This can also be attributed to the ignorance of parents or children who have mental disorders. Until now, the number of practicing psychologists in Indonesia is only around 451 with approximately 773 psychiatrists, which means that this number is not able to meet the treatment needs in Indonesia.

Based on the cases described above, there is a need for a system that can diagnose the beginning of mental disorders that occur in children, so that it can make it easier for parents and children to diagnose the psychological illness they experience and convince sufferers to be able to consult with experts further. In addition, it can also be knowledge for the community about mental disorders in children.

Developing an expert system requires an algorithm that aims to be able to manage information and reasoning from the knowledge base that has been given. In this research, the algorithm used in the expert system as an inference engine is the *Dempster-Shafer* algorithm.

The Dempster-Shafer method was also used in several previous studies and showed good results. In a previous study entitled "Implementation of *Dempster-Shafer* in Overcoming Uncertainty in Inference Machines to Diagnose Oral Cancer" was able to get an accuracy value that reached 86.6%. (Napianto et al., 2021). As well as in other research conducted by Fernando, et al (2022) entitled "Implementation of the *Dempster-Shafer* Algorithm in the Diagnosis of Psychological Diseases of Implus Control Disorders", was able to get an accuracy value that reached 85%. This can show that the application of the *Dempster-Shafer* method is able to diagnose a disease well.

This research aims to apply the *Dempster-Shafer* method to an expert system to diagnose psychological disorders in children. In this study, the system will be used by children in the age category 6 - 13 years and accompanied by parents. It is expected that the results of this study can facilitate users in diagnosing mental disorders that occur in children, get early prevention, and can be knowledge for users about mental health, especially for children.

LITERATURE REVIEW

Expert System

Expert systems are one of several sub-sections of science that exist in artificial intelligence. Expert System is a system that tries to adopt human knowledge into computers, so that computers can help solve problems that are usually solved by experts. (Syahputra, 2022). Expert systems developed in the 1960s, at the beginning of their development expert systems were known as knowledge-based systems designed by utilizing the knowledge of an expert in a particular field and used as a knowledge base to be implemented to solve problems that require an expert. (Fernando et al., 2022) (Mayatopani et al., 2022).

Dempster Shafer

Dempster Shafer is an algorithm based on mathematical theory to prove the value of *belief* and *plausibility* or it can be said that the level of confidence in logical thinking, so it can be useful as a combination of information that becomes evidence to calculate the possibility of events. (Mayatopani et al., 2022). *Dempster Shafer* was first proposed by Dempster, who developed a modeling of uncertainty resolution through probability, which was further developed by Shafer in 1976 in his book entitled *"Mathematical Theory of Evident",* so that the theory is known as *Dempster-Shafer.* In the *Dempster Shafer* method, if the belief has a value of 0, it can be concluded that the belief has no *evidance value,* whereas if the *belief* has a value of 1, there is certainty in the belief. *Belief fuction* is denoted by equation (1).

$$Bel\ (X) = \sum_{\subset X} m(Y) \quad \ldots\ldots (1)$$

In the above equation, Bel (X) is the *belief of* (X), while m (Y) is the mass function of (Y). with a *belief* value range of 0 to 1, the *plausibility* (Pls) can be denoted by equation (2).

$$Pls(X) = 1 - Bel(X') = 1 - \sum_{Y \subset X}^{n} m(X') \quad \ldots\ldots (2)$$

In the above equation, Bel(X) is the *belief of* (X), while m is the mass function. Pls (X) is the *plausibility of* (X). Plausibility has a value between 0 and 1, if there is a belief in X' then *belief* (X') = 1 which results in the result Pls (X) = 0. Based on this equation, the possibilities that will occur between *belief* and *plausibility*

Table 1. Bel and Pls ranges

Certainty	Description
$[\mathbf{1},\mathbf{1}]$	All true
$[\mathbf{0},\mathbf{0}]$	All wrong
$[\mathbf{0},\mathbf{1}]$	Uncertainty
$[\boldsymbol{Bel},\mathbf{1}]$ $\boldsymbol{dimana}$ $\mathbf{0} < \boldsymbol{Bel} < \mathbf{1}$	Tendency of support
$[\mathbf{0},\boldsymbol{Pls}]$ $\boldsymbol{dimana}$ $\mathbf{0} < \boldsymbol{Pls} < \mathbf{1}$	The tendency of rejection
$[\boldsymbol{Bel},\boldsymbol{Pls}]$ $\boldsymbol{dimana}$ $\mathbf{0} < \boldsymbol{Bel} \leq \boldsymbol{Pls} < \mathbf{1}$	Tendency of support and rejection

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Developing an expert system will be closely related to elements that cause possibilities in the answers chosen by users, therefore it requires adjustments to be made by the system. In the *Dempster Shafer* method the possibility is called the *power set* which is symbolized by pθ, to calculate the possibility can use the following equation (3).

$$m = p(\theta) m = P(\theta) \quad (3)$$

In the above equation, m is the *mass function*, which shows the level of confidence in a number of correct answers (*evidences)* or commonly called the *evidance measure* with the symbol m and P(θ) is the *power set*. In the *Demspter Shafer* method to overcome a large amount of *evidance* will use rules called *Dempster's rule of combination.* This rule combines the *evidences* m1 and m2 using the following equation (4).

$$m_1 \oplus m_2(Z) = \sum_{X \cap Y - Z} m_1(X) m_2(Y) \quad (4)$$

In the above equation $m_1 \oplus m_2(Z)$ is the *mass function* of *evidance,* and $m_1(X)$ is the mass *function* of *evidance* (X), $m_2(Y)$ is the *mass function of evidance* (Y) and $\oplus$ is the *direct sum* operator. To calculate *Dempster's rule of combination* can be done using equation (5) below.

$$m_1 \oplus m_2(Z) = \frac{\sum_{X \cap Y - Z} m_1(X) m_2(Y)}{1 - k} \quad (5)$$

In the above equation, k is the sum of the *efidential conflict*. To determine the overall value of k, we can use equation (6) below.

$$k = \sum_{X \cap Y - Z} m_1(X) m_2(Y) \quad (6)$$

$m_1 \oplus m_2$ is the combination of m1 and m2, which becomes m3. So if the equation in formula (5) is entered into equation (6), then for m3 we can use the following equation (7) (Mayatopani et al., 2022).

$$m_3(Z) = \frac{\sum_{X \cap Y - Z} m_1(X) m_2(Y)}{1 - \sum_{X \cap Y - Z} m_1(X) m_2(Y)} \quad (7)$$

Previous Research

This research was conducted on the basis of previous studies related to the title chosen by the researcher, some previous studies are as follows: In previous research conducted by Napianto, et al (2021) with the title "Implementation of *Dempster-Shafer* in Overcoming Uncertainty in Inference Machines for Diagnosing Oral Cancer". This research was conducted to overcome the uncertainty that occurs in expert systems, and based on the results of accuracy testing, it gets good results, namely by achieving an accuracy value of 86.6%. In previous research conducted by Fernando, et al (2022) with the title "Implementation of the *Dempster-Shafer Theory* Algorithm in the Expert System for Diagnosing Psychological Diseases with Implus Control Disorders". This research was conducted to diagnose psychological diseases, especially impulse control disorders using a web-based expert system that aims to make it easier for patients to diagnose. From this study get good accuracy results, namely the accuracy value obtained is 85%. In previous research conducted by Rahmadhani, et al (2020) with the title "Expert System for Early Detection of Mental Health Using the *Dempster-Shafer* Method". This research was conducted to diagnose the initial symptoms that arise in a person affected by mental health disorders. After conducting research and testing the system, the accuracy value of 94% was obtained.

METHOD

This research was conducted at the Psychological Practice of Armita, S.Psi., M.Psi., Psychologist, which is located at Jl. Ikan Kakap No. 35, Kel. Tanah Tinggi, Kec. Binjai Timur, Binjai City, North Sumatra 20731. At the research site, researchers discussed with experts and collected data on psychological disorders that occur in children. In this study, the tools and materials used by researchers during the research are divided into two parts, namely hardware and software. These tools and materials are also used to design a psychological disorder detection system that occurs in children using the *Dempster-Shafer Theory* method. .

The research framework is a design that outlines the flow of a study using images according to the stages carried out in the study. (Ariyanti et al., 2020).

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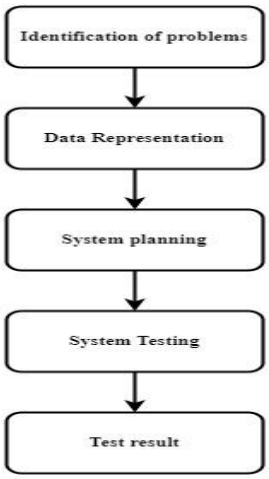

Figure 1. Research Framework

Flowchart and System Workflow

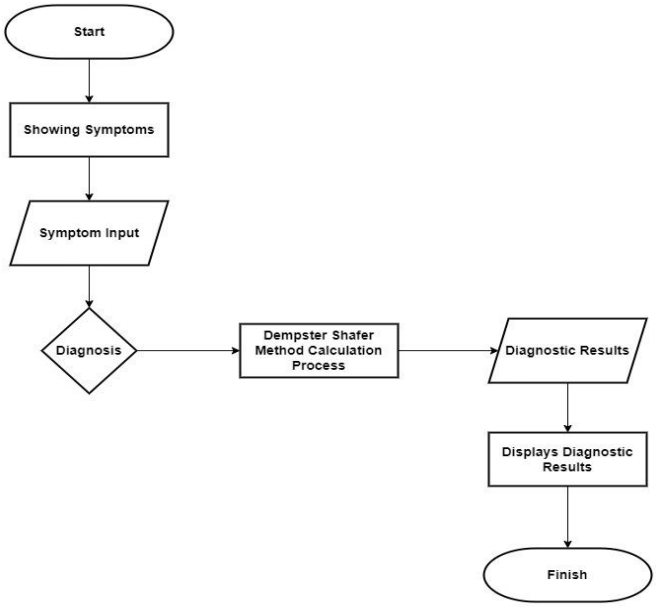

Figure 2. System Flowchart

RESULT

In this results and discussion chapter, the application of an expert system with the *Dempster Shafer* method in diagnosing psychological disorders that occur in children will be presented. The system design will use the Visual Studio Code application. The design of this system also has the aim of diagnosing psychological disorders in children which will then be given a solution to users. Researchers conducted observations and interviews at the Armita Binjai Psychologist Clinic.

Data Representation

In this study, there is some data that researchers have collected, both regarding the types of disorders or diseases, as well as symptoms related to psychological disorders in children. The following is a list of disorders and symptoms in children's psychological disorders.

Types of Psychological Disorders or Diseases in Children

1. The types of psychological disorders that occur in children as well as an explanation of the solutions offered can be seen in table 1 below.

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Table 2. Types of Psychological Disorders in Children

No.	Disease Name	Disease Solution	Code
1	Mental Disorder Autism Spectrum Disorder (ASD)	The solution that can be done if a child has a mental disorder tism spectrum disorder (ASD) is to conduct behavioral and communication therapy, or take drugs to treat behavioral disorders according to what the doctor gives, besides that the child must also do useful and regular activities at home, and still have to consult a psychologist or psychiatrist for the conditions experienced by the child.	P01
...	...	...	...
6	Mental Disorder Mood Disorder	Solutions for mood misorder are individual and family therapy, psychotherapy with a mental health professional, and medication such as mood stabilizers, antidepressants, and SSRIs.	P06

2. Symptoms of Psychological Disorders in Children

Symptoms of psychological disorders that can occur in children can be seen in Table 3. The table explains what the symptoms of child mental disorders are, and explains how much weight the expert gives to each symptom, which will later become a reference in determining the diagnosis results.

Table 3. Symptoms of Psychological Illness in Children

Symptom Code	Child Psychological Symptoms	Weight
G01	The child does not actively interact with others, but is more engrossed in their own activities.	0,8
G02	Often repeats words or sentences he hears	0,6
G03	The child behaves repetitively	0,8
...	...	...
G42	Children tend to have feelings of guilt and uselessness	0,8

3. Rule Base

The rule base used in determining the type of psychological disorder that occurs in children based on their symptoms can be seen in tables 4 and 5 below.

Table 4. Rule Base

Symptom Code	P01	P02	P03	P04	P05	P06
G01	✓					
G02	✓					
G03	✓					
...	...	...	...	...	...	...
G42						✓

Based on the results of the rule base table data above, a rule is formed as a production rule of the system.

Table 5. *Rule*

No.	Rule	Rule Code
1	IF **G01** AND **G02** OR **G03** OR **G04** OR **G05** OR **G06** OR **G07 OR G08** OR **G09** THEN P01	R1
2	IF **G10** AND **G11** OR **G12** OR **G13** OR **G14** OR **G15 OR G16** OR **G17** OR **G18** OR **G19** THEN P02	R2
3	IF **G20** AND **G21** OR **G22** OR **G23** OR **G24** OR **G25** OR **G26** OR **G27** THEN P03	R3
4	IF **G9** AND **G28** OR **G29** OR **G30 OR G31** OR **G32** THEN P04	R4
5	IF **G8** AND **G18** OR **G24** OR **G27** OR **G33** OR **G34** OR **G35** OR **G36** THEN P05	R5
6	IF **G21** AND **G37** OR **G38** OR **G39** OR **G40** OR **G41** OR **G42** THEN P02	R6

Application of the Dempster-Shafer Theory Method

The construction of an expert system for diagnosing psychological disorders in children was developed using an inference engine from the *Dempster Shafer method*. The Dempster Shafer method is a theory that calculates probabilities to get results based on the level of trust and reasoning, which serves to combine information. In the diagnosis process, the system will collect symptom information selected by the user, so that later it will be executed by the system, to perform calculations. The following is an example of a calculation case using the Dempster Shafer method as a tool for diagnosing psychological disorders in children.

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Table 6. Case Example

Symptom Code	Child Psychological Symptoms	Weight
G11	Often lose things/items	0,4
G12	Children are easily distracted by one thing	0,6
G14	Likes to interrupt or interrupt others.	0,6
G15	The child becomes forgetful or has difficulty in remembering information over a long period of time	0,4
G16	Easily distracted by external stimuli	0,6
G37	The child has an impaired appetite.	0,6
G39	Children become tired easily and experience a lack of energy.	0,6

Based on the symptoms that have been selected in the table above, the calculation process using the formula from the Dempster Shafer method is as follows.

1. Symptoms of frequently losing items/things.

Of these symptoms have a weight or density value that has been given by the expert, namely 0.4 symptoms (G11) are symptoms of *Attention Deficit Hyperactive Disorder (*ADHD) (P02), then, to get the *Belief (Bel)* and *Plausibility (Pls)* values, can be done as follows.

$m_1(G11\{P02\}) = 0{,}4$
$m_1\{\theta\} = 1 - 0{,}4 = 0{,}6$

2. Children are easily distracted by one thing.

Of these symptoms have a weight or density value that has been given by the expert, namely 0.6 symptoms (G12) are symptoms of *Attention Deficit Hyperactive Disorder (*ADHD) (P02), then to get the *Belief (Bel)* and *Plausibility (Pls)* values, can be done as follows.

$m_2(G11\{P02\}) = 0{,}6$
$m_2\{\theta\} = 1 - 0{,}6 = 0{,}4$

Based on the results of the *Belief (Bel)* and *Plausibility (Pls)* values on symptoms G11 and G12, which are analogous to symbols m_1 and m_2 then the next step is to calculate the combination of values for m_3 by using equation (7) as follows.

	m2	
m1	(G12{P02}) 0,6	{θ} 0,4
(G11{P02}) 0,4	{P02} 0,24	{P02} 0,16
{θ} 0,6	{P02} 0,36	{θ} 0,24

To get the density value of the combination calculation m_3 above, the following calculation is carried out.

$$m_3\{P02\} = \frac{0{,}24 + 0{,}36 + 0{,}16}{1 - 0} = 0{,}76$$

$$m_3\{\theta\} = \frac{0{,}24}{1 - 0} = 0{,}24$$

3. Likes to interrupt or interrupt others.

$m_4(G14\{P02\}) = 0{,}6$
$m_4\{\theta\} = 1 - 0{,}6 = 0{,}4$

	m_4	
m_3	(G14{P02}) 0,6	{θ} 0,4
{P02} 0,76	{P02} 0,456	{P02} 0,304
{θ} 0,24	{P02} 0,144	{θ} 0,096

$$m_5\{P02\} = \frac{0{,}456 + 0{,}144 + 0{,}304}{1 - 0} = 0{,}904$$

Brilliance
Research of Artificial Intelligence

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Volume 4, **Number** 1, May 2024
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$m_5\{\theta\} = \frac{0{,}096}{1-0} = 0{,}096$

4. The child becomes forgetful or has difficulty remembering information over a long period of time.

$m_6(G15\{P02\}) = 0{,}4$
$m_6\{\theta\} = 1 - 0{,}4 = 0{,}6$

	m_6	
m_5	(G15{P02}) 0,4	{θ} 0,6
{P02} 0,904	{P02} 0,3616	{P02} 0,5424
{θ} 0,096	{P02} 0,0384	{θ} 0,0576

$m_7\{P02\} = \frac{0{,}3616 + 0{,}0384 + 0{,}5424}{1-0} = 0{,}9424$
$m_7\{\theta\} = \frac{0{,}0576}{1-0} = 0{,}0576$

5. Easily distracted by external stimuli

$m_8(G16\{P02\}) = 0{,}6$
$m_8\{\theta\} = 1 - 0{,}4 = 0{,}4$

	m_8	
m_7	(G16{P02}) 0,6	{θ} 0,4
{P02} 0,9424	{P02} 0,56544	{P02} 0,37696
{θ} 0,0576	{P02} 0,03456	{θ} 0,02304

$m_9\{P02\} = \frac{0{,}56544 + 0{,}03456 + 0{,}37696}{1-0} = 0{,}97696$
$m_9\{\theta\} = \frac{0{,}02304}{1-0} = 0{,}02304$

6. The child has an impaired appetite.

$m_{10}(G37\{P06\}) = 0{,}6$
$m_{10}\{\theta\} = 1 - 0{,}4 = 0{,}4$

	m_{10}	
m_9	(G37{P06}) 0,6	{θ} 0,4
{P02} 0, 97696	{ θ } 0,586176	{P02} 0,390784
{θ} 0,02304	{P06} 0,013824	{θ} 0,009216

$m_{11}\{P06\} = \frac{0{,}013824}{1 - 0{,}586176} = 0{,}033405505722239$
$m_{11}\{P02\} = \frac{0{,}390784}{1 - 0{,}586176} = 0{,}9443241571296$
$m_{11}\{\theta\} = \frac{0{,}009216}{1 - 0{,}586176} = 0{,}02227033714816$

7. Children become tired easily and experience a lack of energy.

$m_{12}(G39\{P06\}) = 0{,}6$

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$m_{12}\{\theta\} = 1 - 0{,}4 = 0{,}4$

	m_{10}	
m_9	(G39{P06}) 0,6	{θ} 0,4
{P06} 0,033405505722239	{ P06 } 0,020043303433344	{P06} 0,013362202288896
{P02} 0,9443241571296	{θ} 0,56659449427776	{P02} 0,37772966285184
{θ} 0,02227033714816	{P06} 0,013362202288896	{θ} 0,0089081348592639

$$m_{11}\{P06\} = \frac{0{,}020043303433344 + 0{,}013362202288896 + 0{,}013362202288896}{1 - 0{,}56659449427776} = 0{,}10790750785041$$

$$m_{11}\{P02\} = \frac{0{,}37772966285184}{1 - 0{,}56659449427776} = 0{,}87153868113046$$

$$m_{11}\{\theta\} = \frac{0{,}0089081348592639}{1 - 0.586176} = 0{,}02055381101$$

Program View

The following is a display of the results and discussion of the expert system for diagnosing psychological disorders in children using the Dempster Shafer method.

1. Main Page Display

The main page is the initial display of the expert system for diagnosing psychological disorders in children when the user is accessing it. On this main page, there are several menus that can be accessed, such as Home, Consultation, List of Diseases, Login, and there is a brief explanation of this system. The main page of the system can be seen in Figure 3 below.

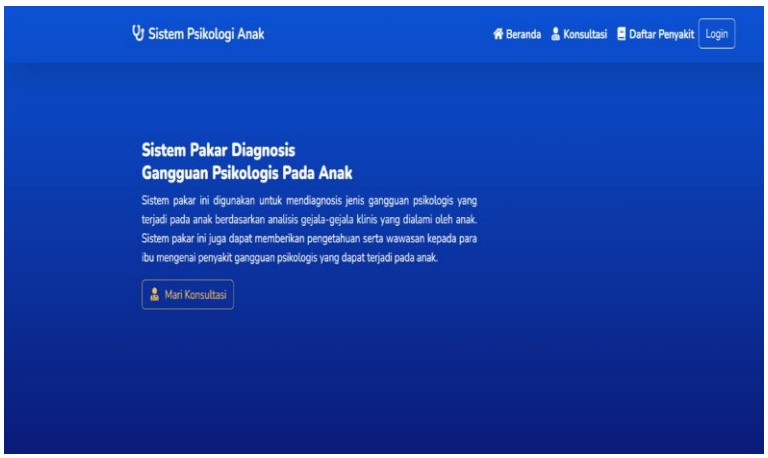

Figure 3. System Home Page

2. Disease List Page View

The disease list page is a page that contains the types of psychological disorders in children available on this system. The display of the disease list page on the system can be seen in Figure 4 below.

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Figure 4. Disease List Page

3. Admin Login Page Display

The admin login page is a page used by the admin to enter the expert system for diagnosing children's psychological disorders, so that the admin can manage diseases, symptoms, and rules from the system. On this page the admin is asked to enter a username and password first. The admin login page can be seen in Figure 5 below.

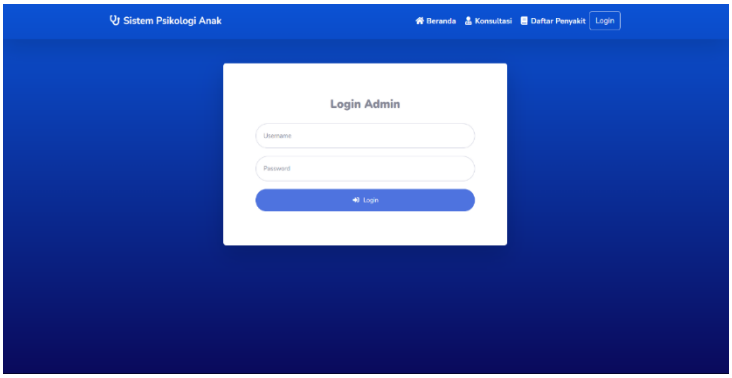

Figure 5. Admin Login Page

4. Administrator Home Page Display

The administrator home page is a page where the admin manages the contents of the system, there are several menus in it such as Disease and Solution Data, Symptom Data, Rule Data, Consultation History Data, and Symptom Data Reports. The administrator's home page can be seen in Figure 6 below.

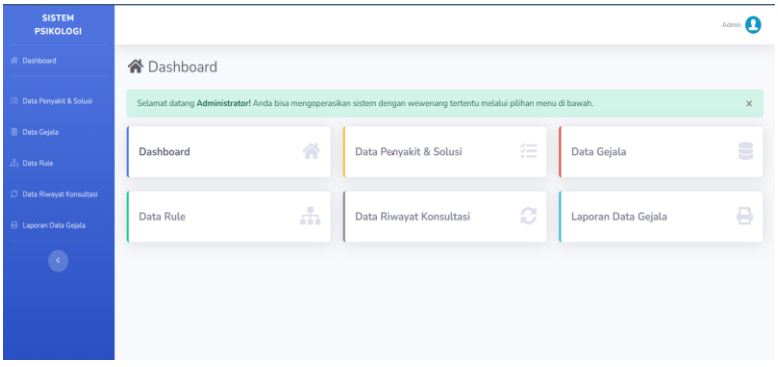

Figure 6. Admin Home Page

5. Administrator's Disease and Solution Data Page

The disease and solution data page is a page where the admin can add or subtract the types of diseases that exist in the system, and can edit the types of diseases that have existed before. The display of the administrator's disease list and solution page can be seen in Figure 7 below.

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Volume 4, **Number** 1, May 2024
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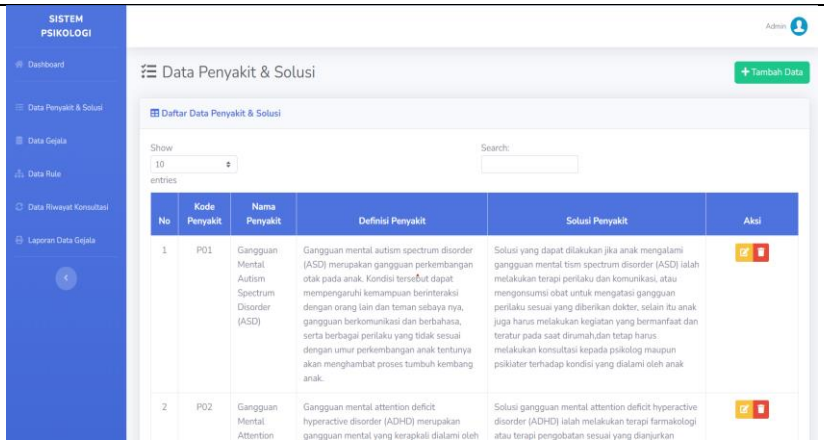

Figure 7. Disease and Solution Data Page

6. Administrator Symptom Data Page Display

The symptom data page is a page where the admin can add or subtract types of symptoms that exist in the system and can edit symptoms that already exist in the system. The display of the symptom list page can be seen in Figure 8 below.

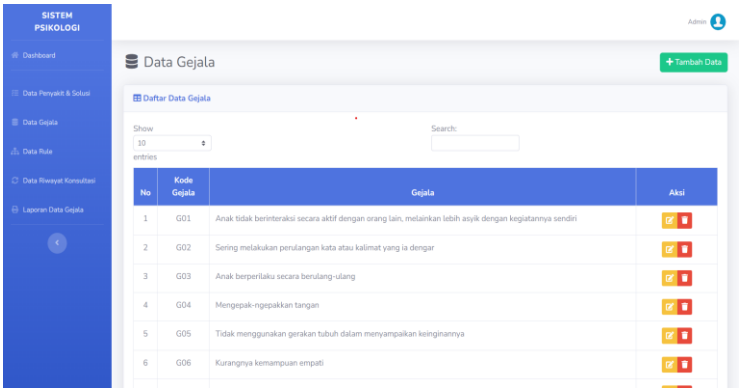

Figure 8. Symptom Data Page

7. Administrator Rule Data Page Display

The rule data page is a page where the admin adds and subtracts data from existing rules on psychological disorders into the system, and can also edit the rule data that has previously existed in the system. The display of the administrator rule data page can be seen in Figure 9 below.

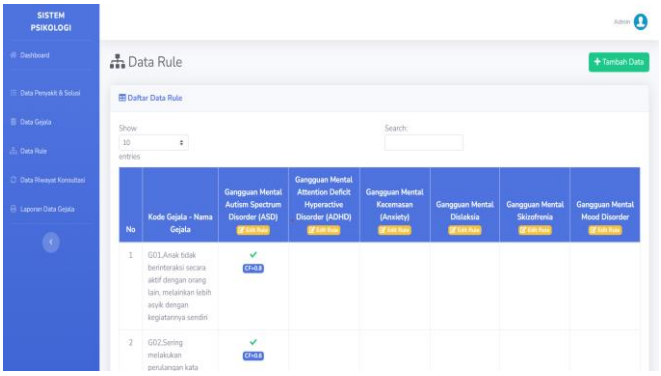

Figure 9. Rule Data Page

8. Administrator Consultation History List Page

The consultation history page is a page that shows the results of consultations conducted by users. The administrator's consultation history list page can be seen in Figure 10 below.

Brilliance
Research of Artificial Intelligence
E-ISSN : 2807-9035
Volume 4, Number 1, May 2024
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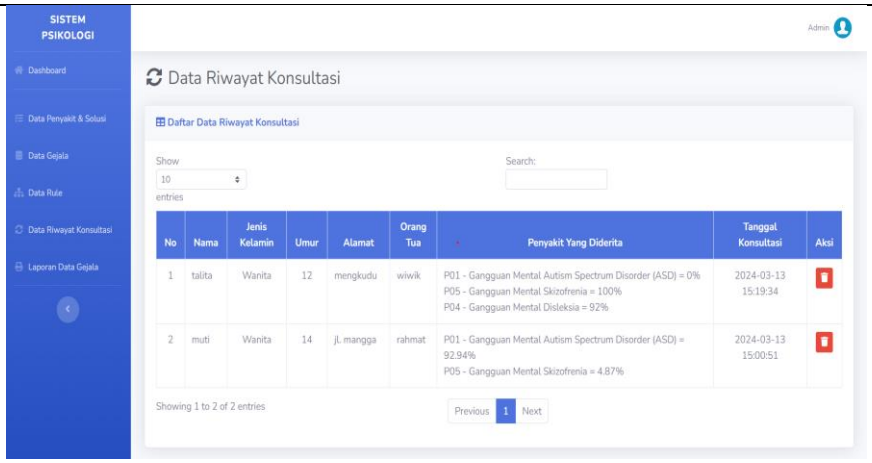

Figure 10. Consultation History Page

9. Display of Administrator Symptom Data Report Page

The symptom data report page is a page that shows the results of the system rule data, where the admin can find out what symptoms are included in one of the diseases or disorders. The display of the administrator's symptom data report page can be seen in Figure 11 below.

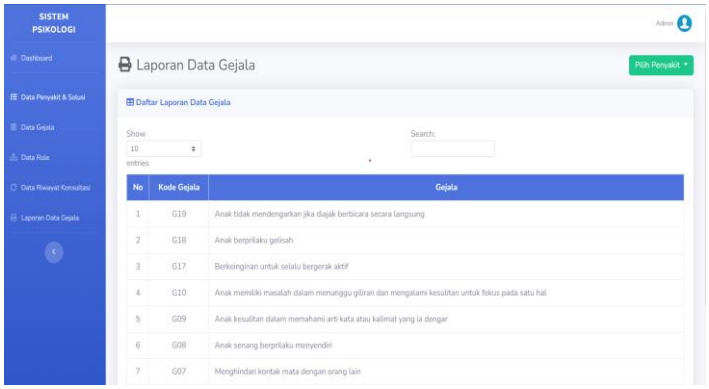

Figure 11: Symptom Data Report Page

10. Consultation Page View

In the expert system for diagnosing psychological disorders in children to conduct a consultation, the user will first select the consultation menu on the main page of the system, then the system will display a consultation form that requires the user to fill in first before choosing symptoms as shown in Figure 12 below.

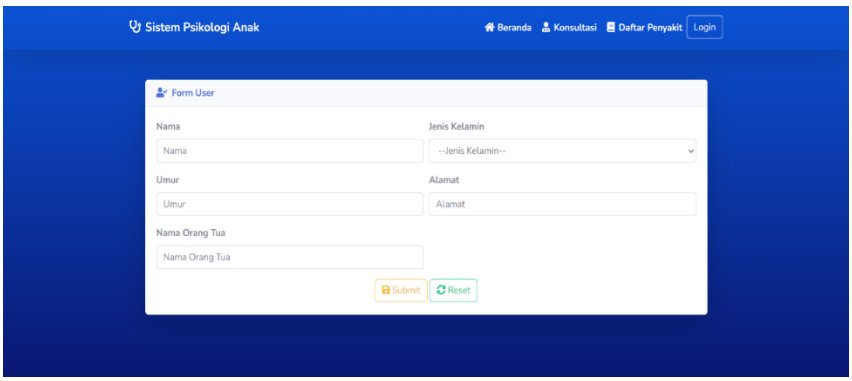

Figure 12. Consultation Form Page

After the user fills out the consultation form, the system will enter the consultation page which contains symptoms of psychological disorders in children. The consultation page can be seen in Figure 13 below.

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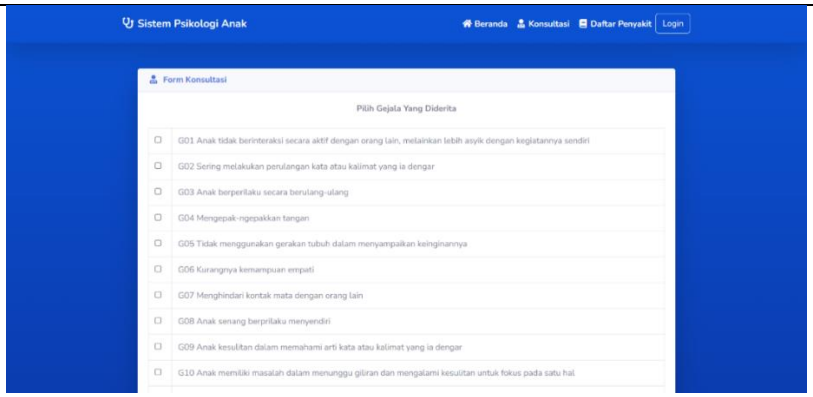

Figure 13. Consultation page

11. Consultation Result Page Display

The consultation results page is a page that shows the diagnosis results of the system regarding psychological disorders that are likely to be suffered by users. The display of the consultation results page can be seen in the following figure.

Figure 14. Consultation Result Page

DISCUSSION

So from the results of the analysis of case examples using the calculation of the Dempster Shafer method regarding psychological disorders in these children, the final result of the diagnosis with the highest value is the disease (P01) Mental *Disorder Autism Spectrum Disorder* (ASD) by obtaining a value of 87.15%. 0,8715 or about 87.15%, here are the complete results of the calculation of the previous case example.

Table 7. Overall Results of the Example Case

Disease Code	Disease Name	Density Value	Percentage
P02	Mental Disorder Attention Deficit Hyperactive Disorder (ADHD)	0,8715	87,15 %
P06	Mental Disorder Mood Disorder	0,1079	10,79 %
θ		0,0205	2,05 %

CONCLUSION

Based on the results and discussion in this research, it can be concluded that the *Dempster Shafer* Method can be applied well in the expert system for diagnosing children's psychological disorders. The *Dempster Shafer* method in this system gets results that are accurate enough so that it can produce a diagnosis based on symptoms accompanied by a handling solution. This expert system application for diagnosing psychological disorders in children can diagnose and determine the diagnosis results from consultations conducted by users using the *Dempster Shafer* method. Where in the example case, the percentage result is around 87.15%. This system can also help parents to get information about children's psychological disorders, symptoms, and solutions that can be applied.

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